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AGE DIFFERENCES IN DEPOSITION ON MUSCLE TISSUE AND CARCASS COMPOSITION IN SHEEP

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One of the parameters in the selection for improvements in meat quality is the growing potential of animals. The postnatal development of muscle tissue according to many researchers is the result of an increase in muscle fibre size and the total number of fibre remains constant at or near birth. Research into the mechanism of muscle fibre growth has shown that the increase of muscle is under physiological control, but depends largely upon the species, genotype and within (Alnaqueeb *et al.*, 1986; Ashmore *et al.*, 1972; Luff *et al.*, 1967; Nougues *et al.*, 1972; Stickland *et al.*, 1978).

The objective of the present study was to determine the values and changes of the main characteristics of some muscles during sheep growth.

MATERIALS AND METHODS

The trail has been conducted on 50 NorthEast fine fleece male lambs. The lambs were fattened up to age 45, 90, 150, 210 and 270 days. All methods used have already been described in detail (Marinova, 1993; Peter *et al.*, 1972). Samples for histological studies were obtained from *m.longissimus dorsi* (mLD), *m.semimembranosus* (mSM) and *m.peroneus longus* (mPL). The muscle fibres were classified according to Peter *et al.* (1972). All data were processed using analysis of variance.

RESULTS AND DISCUSSION

The most accelerated mLD length growth was established from 45 to 150 day-age. Behind that age, the length of growth differ significantly (see Table 1). For mPL, length changes were significantly different up to 210 day-age, as the growth in particular periods were slower but more constant. The cross-section area of mLD increased considerably to 90 day-age. At later ages, the increases slowed and the difference were less significant.

The increasing in the cross-section area of mPL were not so intensive and differences were significant only at 90 to 150 day-age and 150 to 210 day-age. The mPL weight increased due to the same age, but the differences were more significant. The results of the fibre numbers from all ages did not differ. Research into postnatal muscle weight changings showed that they mainly depended on the muscle fibre numbers, length and size (Lefaucheur *et al.*, 1986; Robelin, 1989; White *et al.*, 1978). These authors have reported also that the number of myofibrils is determined at or near borth and that myofibrilars length developemnt stop before their increasing in diameter. Results obtained in the present study were similar to those of reports cited. The differences in the weight development of the muscles decreased with the age and in the end of the experiment, had achieved close growth coefficient. Nougues (1972) has reported that the muscle fibre numbers remains constant after birth. He found a high correlation (0.98) between age and muscle weight, and a low correlation (0.26) between fibre numbers and age.

Fibre size growth showed that the muscle area increasing depends on all fibre types development (see Table 2). In mLD So fibres increased most intensively up to 90 to 150 day-age. In mSM, the changes in the same fibres were less, but their increasing continued to later age. The significant FG size increasing in mLD was established up to 150 day-age and for mSM, between 45 to 90 and 150 to 210 day-age. Glycolitic fibres had a higher growing potential in both muscles up to 90 day-age, but the differences were significant up to 150 day-age. The FG fibres proportion increased significantly up to 150 day-age in both muscles, but in mSM the differences were more significant between 90 and 150 day-age.

The obtained results of postnatal fibre size and type development lead to a conclusion that muscle growth was mainly a result of myofibrilar diameter increasing. Similar results have been reported by other authors. They have established that the fibre diameter increased equivalently during the postnatal period and that So fibre is possible to achieve bigger diameter compare to the other types as well as that So population develops slowly with aging. In the present study, such tendency was observed, but at the later age, the transformation was restricted only from FoG to FG fibres. In previous studies, the same transformation of the fibres was established together with their diameter increases and these facts supposed a higher glycolitic potential (Marinova, 1993).

The results of carcass analysis was reported (Marinova, 1993) and showed that behind 150 day-age, muscle tissue deposition decreased and adipose tissue content in carcass significantly increased.

CONCLUSIONS

The total fibre numbers changed insignificantly due to growth. The increasing mLD, mSM and mPL during the postnatal development is the result of an increase in fibre size. The length increasing was more intensive at the early age and the increase in size of all muscle fibre types occured considerably at 150 day-age. The muscle fibre population developed with the cells hypertrophy and the percentage of FG fibres increased.

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Table 1. Postnatal growth and number of muscle fibres in *m.longissimus dorsi* and *m.peroneus longus*.

age, days	*m.longissimus dorsi* length, cm	weight, g	area, cm^2	number of fibres
45 (1)	22.5	105.8	3.46	175,950
90 (2)	27.8	133.3	5.61	167,130
150 (3)	29.2	197.2	7.40	168,022
210 (4)	32.9	257.1	8.42	168,804
270 (5)	32.9	296.4	11.08	177,097
	1 < 2 ***	2 < 3 * 3 < 4 *	1 < 2 ** 2 < 3 *	

age, days	*m.peroneur longus* length, cm	weight, g	area, cm^2	number of fibres
45 (1)	4.9	1.6	0.48	84,432
90 (2)	6.2	2.1	0.60	87,476
150 (3)	6.6	2.8	0.67	84,325
210 (4)	7.6	3.8	0.77	81,807
270 (5)	7.8	4.1	0.92	78,740
	1 < 2 ** 2 < 3 ** 3 < 4 *	1 < 2 * 2 < 3 *** 3 < 4 **	4 < 5 **	

1,2,3,4,5 = age of animals;
* P < 0.1; ** P < 0.05; *** P < 0.025

Table 2. Size and metabolic type of muscle fibres in *m.longissimus dorsi* and *m.semimembranosus*.

	m.longissimus dorsi					
	diameter, µm			metabolic type, %		
	So	FoG	FG	So	FoG	FG
45 (1)	39.42	40.25	40.99	14.7	51.0	34.3
90 (2)	42.66	41.65	42.35	12.2	51.2	36.6
150 (3)	44.12	44.85	46.04	11.7	48.0	40.3
210 (4)	45.25	44.42	47.57	12.2	45.9	41.9
270 (5)	45.71	47.18	48.82	12.2	44.3	43.5
	1 < 2 *** 2 < 3 *		1 < 2 *** 2 < 3 *			1 < 2 * 2 < 3 *

	m.semimembranosus					
	diameter, µm			metabolic type, %		
	So	FoG	FG	So	FoG	FG
45 (1)	40.12	40.00	40.24	16.0	56.7	27.3
90 (2)	43.21	42.83	44.26	13.3	54.1	32.6
150 (3)	43.91	42.41	48.42	11.5	48.1	40.4
210 (4)	46.71	47.31	50.20	12.4	49.4	38.2
270 (5)	46.66	46.30	48.91	11.7	48.2	40.1
	1 < 2 *		1 < 2 *** 2 < 3 **	2 < 3 **		1 < 2 * 2 < 3 ***

1,2,3,4,5 = age of animals;
* P < 0.1; ** P < 0.05; *** P < 0.025